802.1Qcc Configurable SR Classes

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Introduction

- Context for this presentation (from 802.1Qcc PAR): Configuration of the parameters of an SR class

- Agenda
  - Review AVB (Gen 1)
  - My assumptions for goals of 802.1Qcc
  - Proposal for 802.1Qcc

Review AVB (Gen 1)

Parameters of an SR Class

- Priority
  - Negotiated using Domain PDU

- Measurement Interval
  - Fixed: 125μs for class A, 250μs for class B

- Transmission Selection Algorithm
  - Fixed: All classes use credit-based shaper (ID 1 in Table 8-5)

- VLAN ID? No
  - Specified per-stream by Talker
  - Multiple VID are allowed for each class
  - Bridge declares default (mgmt) in Domain PDU: Informative

Domain Negotiation: End-station

- Use default priority on MAC_Operational

  - Priority 3 for class A, 2 for class B (Table 6-6)

- Declare (transmit) Domain PDU with my priority

- If register (receive) Domain PDU with non-default…

  - If (my priority == default) change to non-default, and declare

  - Else if (my priority == non-default) domain is agreed

    - SRPdomainBoundaryPort = false

  - Else if (my priority != non-default) domain is boundary

    - SRPdomainBoundaryPort = true

    - Talker Advertise → Talker Failed across boundary

- Key concept: Non-default overrides default

Domain Negotiation: Bridge (1 of 2)

- Decide domain boundary per-port, per-class
- Each port declares priority in Domain PDU
  - If no mgmt value, use default
- If register different priority, domain is boundary
  - SRPdomainBoundaryPort = true
  - Talker Advertise $\rightarrow$ Talker Failed across boundary
- No attribute propagation (MAP) for Domain
  - Register does not declare on other ports
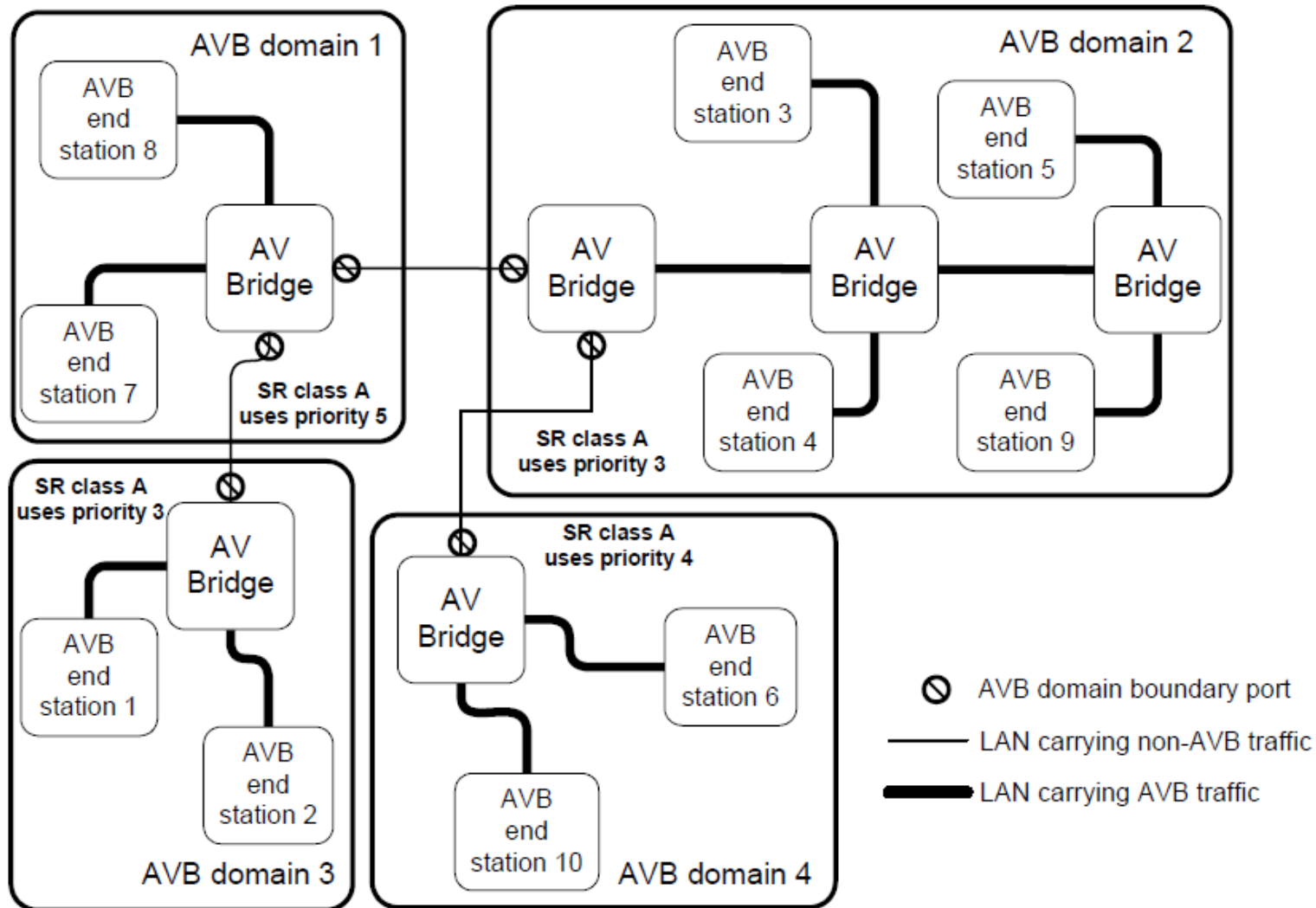
Domain Negotiation: Bridge (2 of 2)

Figure 5-3—AVB domain boundaries created by different SR class A priorities

My Assumptions
for Goals of 802.1Qcc
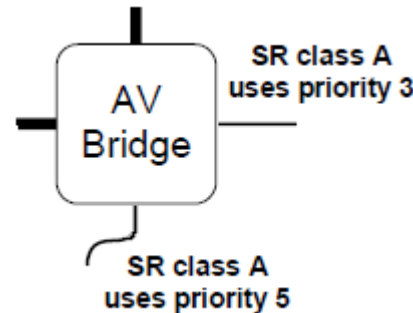
What is a Domain?

- Parameters for the entire SR class
  - Not stream-specific

- Negotiated agreement between contiguous devices
  - End-stations as well as bridges

- Purpose: Consistency for streams in the domain
  - Core benefit of TSN: Ability to know the timing of data
  - For that to work, need to know parameters that affect timing
  - Domain establishes agreement for those parameters

Qcc Goal: New Parameters in Domain

- Concept: Negotiate new parameters as we do priority

- This presentation focuses on <u>methodology</u>, not the specific parameters for domain

- Proposal uses two example parameters

  - Measurement Interval
    - Some apps need faster (e.g. 31.25µs), some slower (1000µs)

  - Transmission Selection Algorithm
    - Some apps need strict-priority (e.g. 802.1Qbv scheduling)
    - Need placeholder for future shapers

- Future presentations will cover what is / isn't in domain

  - E.g. We may also want frame preemption (802.1Qbu)

Qcc Goal: Resolve Domain Issues

- Management parameter for priority is read-only
  - Priority Regeneration Override Table
    - Rows are per-port, per-class
  - Change 'R' to 'RW'?

- Unspecified behavior for internal domain boundaries
  - If I manage my bridge as…
  - … with no boundaries (externally)…
  - … and Talker Advertise with priority 5 registers on bottom port…
  - … what do we propagate (declare) on right side?

AV Bridge

SR class A uses priority 3

SR class A uses priority 5

Proposal for 802.1Qcc

MSRP ProtocolVersion v0 → v1

- In order to add parameters to Domain PDU, we must increment MSRP ProtocolVersion
  - Applies to all MSRP attributes (e.g. Talker Advertise), but this proposal changes Domain only
- Backward compatibility is mandatory
  - 802.1Q-2011 10.8.3.5
- Benefits of v1 available to contiguous v1 devices
  - All others implement v0 (AVB Gen 1)

Add to Domain FirstValue (1 of 4)

Octet #	Name	Comment	
1	SRclassID	Full octet; Table 35-7: A=6, B=5	v0
2	SRclassPriority	Defaults in Table 6-6: A=3, B=2	
3-4	SRclassVID	Default in Table 9-2: 2	
5-8	SRclassMeasurementInterval	32-bit nanoseconds (1 ns to 4.3 sec)	v1
9-12	SRclassTransmissionSelection	Table 8-5 (strict=0, credit=1, …)	

- If v0 receives v1, ignore extra v1 parameters

- If v1 receives v0, interpret as v0

  - Assumes MeasInterval=125µs/250µs, TxSelection=credit

Add to Domain FirstValue (2 of 4)

- With this proposal thus far… we have a problem…

  1. v0 bridge port declares classID=A, Priority=3

  2. v1 bridge port declares classID=A, Priority=3, MeasInterval=500µs, TxSelection=strict

  3. v0 port receives v1 PDU and ignores new v1 params

  4. v0 port incorrectly sets SRPdomainBoundaryPort = false

- To resolve problem, use upper bit of v0 SRclassID

  - v1 port sets true if params are incompatible with v0

  - v0 port sees true as unsupported SRclassID, and sets boundary = true according to 802.1Q, 35.2.1.4.h.3

Add to Domain FirstValue (3 of 4)

Octet #	Name	Comment	
1, bit 7	SRclassIsExtended	Boolean (see formula below)	v1
1, bits 0-6	SRclassID	Lower 7 bits; Table 35-7: A=6, B=5	v0
2	SRclassPriority	Defaults in Table 6-6: A=3, B=2	
3-4	SRclassVID	Default in Table 9-2: 2	
6-9	SRclassMeasurementInterval	32-bit nanoseconds (1 ns to 4.3 sec)	v1
10-13	SRclassTransmissionSelection	Table 8-5 (strict=0, credit=1, …)	

- If   (declaring as v0) OR
  (SRclassID=A, MeasInterval=125µs, TxSelection=credit) OR
  (SRclassID=B, MeasInterval=250µs, TxSelection=credit)
  SRClassIsExtended = false

- Else SRClassIsExtended = true

Add to Domain FirstValue (4 of 4)

- What happens when we add more parameters in v2?

    - We don't want to use yet-another bit of SRclassID

- Proposal: TLV for each parameter

    - E.g. SRclassMeasurementInterval uses Type=1, Length=4

    - Rule for v1 and higher:

        - If (receive an unknown Type) SRPdomainBoundaryPort = true

    - Enables addition of new parameters to MSRP v1

        - We don't necessarily need to go to MSRP v2 for domain alone

Negotiation: Check New Parameters

- End-station to neighbor

    - Fundamentally same as v0: Non-default overrides default

    - Add MeasInterval and TxSelection to check

        - 802.1Q, 35.2.2.9.3

- Bridge to neighbor

    - Fundamentally same as v0: Declare my mgmt params, compare to registered to set boundary as true/false

    - Add MeasInterval and TxSelection to check

        - 802.1Q, 35.2.1.4.h.2

Bridge Mgmt: Priority Read-write

- "Priority Regeneration Override Table", 802.1Q(av), 12.20.3
  - Current purpose
    - Ingress on non-AVB port of SR class priority… regen another priority
    - "Received priority" is SR class priority… read-only (always 3 or 2)
  - New purpose (intended): SR class parameter management
- MIB for this table (17.2.12 and 17.7.12) uses
  - "ieee8021FqtssSrpRegenOverrideTable"
  - "ieee8021FqtssSrClassPriority" (not "Received priority")
- Proposal (to be validated with Tony J and Craig G):
  - Change "Received Priority" from read-only to read-write
  - Change text name of "Received priority" to "SR class priority"
  - Leave table name as-is, but add Note for new purpose

Bridge Mgmt: New Parameters

- Proposal: Add Measurement Interval to Regen Table

  - Add each new parameter there as read-write

- Transmission Selection Algorithm Table (12.20.2)

  - Rows are per-port, per-class

  - "Transmission selection algorithm" already there as read-write

    - Not negotiated in v0, but will be negotiated in v1

  - No change required

Failure Code for External Boundary

- 802.1Q-2011 specifies how SRPdomainBoundaryPort is set… does not specify what to do when true

- 802.1BA-2011, 6.4.a.2: If asCapable false, set SRPdomainBoundaryPort true, and… propagate Talker Ad as Talker Failed across boundary
  - Failure Code 8: "Egress port not AVB capable"

- Proposal: Add similar text to 802.1Q, 35.2.4.3
  - For boundary due to any domain parameter mismatch, propagate Talker Ad as Talker Failed
  - Failure Code 19 exists: "SR class priority mismatch"
    - Change text to "SR class parameter mismatch"

Resolve Internal Boundary Issue

- Internal boundary for Talker Advertise (TA)

  - Ports managed differently,
    but not an external boundary

- Proposal: Consistent with external

  - Describe the scenario

  - Talker Ad propagates as Talker Failed, Failure Code 19

- Alternative for external/internal: Gateway

  - Convert SR class parameters (e.g. priority) rather than fail

  - If someone has a use-case for this, please present